

## ABSTRACT OF THE DISCLOSURE

The invention includes deposition apparatuses configured to monitor the temperature of a semiconductor wafer substrate by utilizing conduits which channel radiation from the substrate to a detector/signal processor system. In particular aspects, the temperature of the substrate can be measured while the substrate is spinning within a reaction chamber. The invention also includes deposition apparatuses in which flow of mixed gases is controlled by mass flow controllers provided downstream of the location where the gases are mixed and/or where flow of gases is measured with mass flow measurement devices provided downstream of the location where the gases are mixed. Additionally, the invention encompasses deposition apparatuses in which mass flow controllers and/or mass flow measurement devices are provided upstream of a header which splits a source gas into multiple paths directed toward multiple different reaction chambers.